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Integration of Digital Technologies in Education: challenges and working conditions in schools of Jundiaí-SP

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ABSTRACT

This study aimed to investigate the integration of Digital Information and Communication Technologies (DICT) in municipal schools in Jundiaí-SP, focusing on the challenges faced by educators regarding infrastructure and working conditions. The qualitative research, conducted in three elementary schools, involved semi-structured interviews, observations, and document analysis before the pandemic. The results reveal that, although teachers recognize the importance of DICT for student engagement, the scarcity of adequate equipment, lack of technical support, and insufficient specialized training hinder its effective use. Additionally, workload overloads, such as large class sizes and long hours, negatively impact teacher performance and the quality of education. Many teachers resort to using their own devices to compensate for infrastructure deficiencies. The study highlights the disconnect between educational modernization theory and school practice, suggesting the urgent need for public policies that improve infrastructure, ensure continuous teacher training, and provide adequate technical support, enabling the effective integration of DICT into teaching practices.

Keywords: Teaching working conditions; digital information and communication technologies; pedagogical challenges; educational infrastructure; digital culture.

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INTEGRAÇÃO DAS TECNOLOGIAS DIGITAIS NA EDUCAÇÃO: desafios e condições de trabalho em escolas de Jundiaí-SP

RESUMO

Este estudo objetivou investigar a integração das Tecnologias Digitais de Informação e Comunicação (TDIC) nas escolas municipais de Jundiaí-SP, com foco nos desafios enfrentados pelos professores em relação à infraestrutura e às condições de trabalho. A pesquisa qualitativa, realizada em três escolas de ensino fundamental, envolveu entrevistas semiestruturadas, observações e análise documental antes da pandemia. Os resultados revelam que, embora os professores reconheçam a importância das TDIC para o engajamento dos alunos, a escassez de equipamentos adequados, a falta de suporte técnico e a insuficiência de treinamento especializado dificultam seu uso eficaz. Além disso, as sobrecargas de trabalho, como turmas numerosas e longas jornadas, impactam negativamente o desempenho docente e a qualidade do ensino. Muitos professores recorrem a seus próprios dispositivos para suprir as deficiências de infraestrutura. O estudo destaca a desconexão entre a teoria da modernização educacional e a prática escolar, sugerindo a necessidade urgente de políticas públicas que melhorem a infraestrutura, garantam a formação contínua dos docentes e ofereçam suporte técnico adequado, permitindo uma integração efetiva das TDIC nas práticas pedagógicas.

Palavras-chave: Condições de trabalho docente; tecnologias digitais de informação e comunicação; desafios pedagógicos; infraestrutura educacional; cultura digital.

Integración de las Tecnologías Digitales en la Educación: desafíos y condiciones de trabajo en escuelas de Jundiaí-SP

RESUMEN

Este estudio tuvo como objetivo investigar la integración de las Tecnologías Digitales de Información y Comunicación (TDIC) en las escuelas municipales de Jundiaí-SP, con un enfoque en los desafíos enfrentados por los docentes en relación con la infraestructura y las condiciones de trabajo. La investigación cualitativa, realizada en tres escuelas de educación primaria, incluyó entrevistas semiestructuradas, observaciones y análisis documental antes de la pandemia. Los resultados revelan que, aunque los docentes reconocen la importancia de las TDIC para el compromiso de los estudiantes, la escasez de equipos adecuados, la falta de soporte técnico y la insuficiencia de formación especializada dificultan su uso eficaz. Además, las sobrecargas de trabajo, como clases numerosas y jornadas laborales largas, impactan negativamente en el desempeño docente y en

la calidad de la enseñanza. Muchos docentes recurren a sus propios dispositivos para suplir las deficiencias de infraestructura. El estudio destaca la desconexión entre la teoría de la modernización educativa y la práctica escolar, sugiriendo la necesidad urgente de políticas públicas que mejoren la infraestructura, garanticen la formación continua de los docentes y ofrezcan un soporte técnico adecuado, permitiendo una integración efectiva de las TDIC en las prácticas pedagógicas.

Palabras clave: Condiciones de trabajo docente; tecnologías digitales de información y comunicación; desafíos pedagógicos; infraestructura educativa; cultura digital.

1. Introduction, Contextualization, and Theoretical-Practical Relevance of the Study

Digital Information and Communication Technologies (ICTs) have profoundly reshaped social, cultural, political, and economic dynamics in the 21st century. According to data from the International Telecommunication Union (ITU, 2015), global internet penetration has significantly increased, with substantial impacts in Brazil, where the TIC Domicílios survey (CETIC.BR, 2015) indicated that 58% of the population was connected. This digital transformation is not limited to immediate communication but is aligned with the paradigm of flexible accumulation of capital, directly influencing power and social structures.

In the educational sphere, the integration of ICTs, highlighted by Belloni (2010) and Mill (2010), presents both opportunities for pedagogical innovation and technological challenges. However, their implementation in schools often fails to address the challenges faced by teachers, potentially undermining educational innovation. Therefore, the study focuses on how ICTs impact the working conditions of teachers in three schools within the Municipal Education Network of Jundiaí-SP, analyzing the available infrastructure, pedagogical practices, and the support policies necessary for the effective integration of technologies. The article also investigates the profiles of teachers in relation to the use of ICTs, identifying factors that either facilitate or hinder their effective pedagogical incorporation.

Therefore, the scope of the article is to explore the adoption of ICTs in the school environment and their relevance to the working conditions of teachers. While public policies and the technological discourse promote a modernized society, the reality in schools often presents a significant gap between theory and practice in the implementation of ICTs, as identified by Zeichner (1997; 2008). It is questioned whether current teacher training, as discussed by Favacho and Mill (2007), adequately prepares teachers for the demands of ICTs, and whether the pressure for productivity undermines the quality of teaching work. Finally, the analysis reveals the urgent need for robust educational policies that ensure not only access but also the meaningful integration of ICTs, fostering pedagogical practices that respect autonomy and promote the professional development of teachers.

2. Methodological Approaches

The research adopted a qualitative approach, involving interviews, document analysis, and participant observation. A result of a master's thesis in Education, the study explores the experiences of individuals in the school environment to analyze working conditions and the integration of digital technologies. According to Creswell (2010), qualitative research aims to understand the meaning attributed by individuals or groups to social issues, collecting data in a natural setting, developing inductive analyses, and interpreting the data within the appropriate context.

The method was organized into three phases: immersion in the theoretical field, data collection and analysis, and writing to share the results. The research involved elementary school teachers from three municipal schools in Jundiaí-SP, representing different experiences and perspectives on the use of Digital Information and Communication Technologies. Data collection, conducted between August and October 2016, employed ethnographic strategies such as interviews, observations, and document analysis to capture daily interactions and institutional structures related to the use of technologies.

During the preliminary analysis, a comprehensive literature review was conducted to establish the theoretical foundations, dividing the focus between "Education and Technology" and "Teaching Working Conditions." This preliminary analysis helped outline the study's guidelines and guided the formulation of the analysis categories. A balance was maintained between a deterministic view and an idealized view of technologies, ensuring a comprehensive approach to understanding "education and technology."

The data collection was extensive and diverse. Direct observations and semi-structured interviews were used to understand the realities of teachers, their pedagogical methods, and their reactions to ICTs. The data analysis followed a categorization process described by Bardin (2016), which systematizes the classification of the collected information, identifying patterns and relevant themes. This process provided a comprehensive view of the relationships between ICTs and pedagogical practices, highlighting both challenges and opportunities.

The sample of teachers includes six full-time teachers from the municipal network of Jundiaí-SP, all working in elementary education (grades 1-5). Two teachers work in more than one educational unit due to an overload of classes or accumulation of positions. Five teachers are generalists, while one teaches a specific subject. The career length varies from seven to 30 years, and although all have higher education degrees, only two have received training that addressed ICTs. The workweek is 26 hours, with generalist teachers having one class, while teachers of specific subjects work across multiple classes. Table 1 presents the professional profile of the teachers, including career length, ICT training, and the schools where they work.

3. Pesquisa validada pelo Parecer Consubstanciado do Comitê de Ética de número: 1.460.320.

Table 1. Professional Profile of Teachers from the Municipal Department of Education (SME) of Jundiaí-SP

Teachers	Permanent	Career length	Training in ICTs	School
C	Yes	26 years	No	Gamma
J	Yes	7 years	Yes	Beta
L	Yes	12 years	No	Gamma
M	Yes	11 years	Yes	Gamma
N	Yes	30 years	No	Beta
S	Yes	20 years	No	Alpha

Source: Own elaboration, based on data collected for the research and the Municipal Education Plan (PME) of the municipality.

Finally, the results were synthesized into a dissertation, which not only documents the findings but also contributes to the academic and practical debate on the integration of ICTs in education. The final phase emphasizes the need for critical reflection on teachers' working conditions and the role of ICTs, suggesting strategies for more effective implementation that consider both pedagogical needs and teachers' labor conditions.

3. Informational Capitalism and Discourses on Education: A Brief Literature Review

Manuel Castells (2000) defines informational capitalism as an era where production processes are computerized, and production relations are reshaped into a "network society." This model values autonomy and decision-making capacity, requiring a flexible worker who is continuously requalified. Education, within this context, is rapidly impacted by the introduction of ICTs, which alter both pedagogical methods and the essence of teaching. Pierre Lévy (1999) emphasizes the increased pressure on educational systems to meet the demand for training through methods such as interactive multimedia and distance learning, which are essential in an economy that demands diversification and personalization.

Educational discourses, as noted by Lion (1997) and Peixoto and Araújo (2012), oscillate between technophobia and technophilia, reflecting perspectives that both idealize and criticize ICTs as pedagogical tools. The National Common Curricular Base (BNCC), revised in 2018, emphasizes the importance of using ICTs in a critical and ethical manner, preparing students for knowledge production and problem-solving in a collective and authorial way (Brazil, 2018).

The integration of ICTs is often aligned with neoliberal expectations of productivity, which can overlook teacher training and career development (Bueno and Gomes, 2011; Ferreira and Bueno, 2014). Therefore, a critical evaluation is crucial, one that considers both the potential and limitations of ICTs, aligning them with institutional and educational realities for effective integration into education. All of their technical possibilities, more or less relevant depending on the content, situation, and needs of the "learner," can be considered and have already been widely tested and experimented with (Lévy, 1999).

3.1. On the Teacher Facing Working Conditions in the Network Society of Informational Capitalism

In informational capitalism, ICTs reshape the relationship between capital and labor through "flexible accumulation" (Harvey, 1993), marking the transition to a more flexible and specialized production model. According to Gramsci (1980), this results in a technical inversion where machines dominate the workers. Marx (1984) also observed that technological development profoundly transformed industry, causing the worker to become an appendage of the mechanical process, increasing the intensity of labor and altering its nature.

Transposing this analysis to education, it is observed that teachers face significant challenges in new learning environments that go beyond the technical understanding of ICTs. Schools are challenged to adapt their educational structures to prepare students for a technologically advanced labor market, while also needing to develop practices that preserve teacher autonomy. However, this autonomy may be compromised without the proper support and effective dialogue to navigate the contradictions imposed by the demands of informational capitalism.

3.2. On ICTs as Tools for Teaching Work

Digital Information and Communication Technologies have been integrated into the educational system as part of a productive restructuring that reconfigures social institutions and markets. Habermas (1987) argues that this technological supremacy transforms social production, imposing new forms of work organization and shaping human interests according to domination interests. Vieira Pinto (2005) criticizes technocentrism, which elevates technology to an almost mythical status, potentially obscuring the human and political dynamics behind its adoption. Meanwhile, UNESCO, in its "ICT Competency Standards for Teachers" (2009), argues that ICTs can improve teaching practice and educational quality, although it also emphasizes productivity and competitiveness in the market. However, the effectiveness of ICTs in education depends on the availability of adequate infrastructure, ongoing teacher training, and a careful evaluation of their pedagogical implications. Oliveira (2023) observes that in the peripheries of capitalism, the adoption of foreign technologies follows a model that favors negotiations that may not meet local needs.

3.3. On the Additional Demands for Teaching Work Arising from the Technological Discourse

To avoid an overly optimistic view of technology, it is crucial to recognize the risks of labor precariousness, such as structural unemployment and the erosion of labor protections identified by Harvey (1993) and Antunes (2014). In the era of informational capitalism, the introduction of digital technologies into educational systems often overlooks the working conditions of teachers, as noted by Mill (2018). The often market-driven educational discourse, described by Barreto and Leher (2008), promotes technology as a panacea, ignoring structural inequalities.

Duchâteau (1996) highlights that the intensification of teaching work includes demands such as adequate equipment, continuous training, and proper technical support, which are essential but often insufficient. Lévy (1999) emphasizes that the skills acquired by teachers can quickly become obsolete, requiring constant retraining. In this context, the importance of digital literacy stands out, as it is essential for adapting pedagogical practices to the new reality, highlighting the need for informational competence that allows teachers to access and use information critically.

In summary, the incorporation of ICTs in education requires not only the development of technological skills but also policies that ensure autonomy and value the critical role of teachers in the teaching process.

3.4. On Teachers' Working Conditions

In the network society, the effective implementation of ICTs in education crucially depends on teachers' working conditions, which include adequate infrastructure, technical and administrative support, and appropriate pedagogical resources. As highlighted in the UNESCO and ILO "Recommendation on the Status of Teachers" of 1966, working conditions have a significant impact on the social position of teachers, influencing salary, benefits, and motivation. Soares (2012) emphasizes that these conditions must encompass more than salary aspects, incorporating vital elements for teaching effectiveness (ILO, 1996).

Essentially, working conditions can be categorized into pedagogical environment and digital literacy. The first involves physical infrastructure and interaction standards, while the second refers to teachers' competence in handling digital tools. Studies have shown that there are significant deficiencies in teachers' understanding and specialization in the use of ICTs, exacerbated by the lack of adequate technological infrastructure in schools.

For ICTs to be effectively integrated into education, it is essential that public policies and school management continuously invest in infrastructure, teacher training, and technical support. Additionally, it is necessary to reassess pedagogical practices so that technology is used in a way that respects autonomy and promotes the professional development of teachers. On-site observations can help identify which categories of working conditions need improvement to support the desired educational transformation.

4. Presentation of Data: Categories for Understanding Teachers' Working Conditions in the Context of ICTs

Álvaro Vieira Pinto (2005) discusses that advanced technologies arise from the social accumulation of knowledge and the way humans make use of them. Based on this idea, we investigate the working conditions of teachers in the Municipal Education Network of Jundiaí-SP, analyzing school infrastructure, availability of digital devices, technical support, and spaces for dialogue about technology—all crucial for the integration of ICTs in the educational environment. In this exploration of the topic, we made two moves:

i. Characterization of the Schools in the Municipal Education Network of Jundiaí-SP:

- *Infrastructure for Technology Integration:* We analyzed the technological infrastructure, available resources, and the necessary apparatus for an efficient integration of ICTs.
- *Communicational Spaces for Technology Use:* We evaluated the spaces available for communication and technological interaction.
- *Contractual Relations:* We discussed policies and agreements that influence the use of technologies in pedagogical practices.

ii. Characterization of Communication Spaces:

- *Pedagogical Meetings of Teachers:* We assessed the frequency and quality of meetings focused on the use of technologies.
- *Pedagogical Projects Focused on the Use of Technologies:* We investigated how pedagogical projects for the use of ICTs are developed and implemented.
- *Presence of ICTs and Stimulus Actions:* We assessed the effectiveness of actions aimed at encouraging the use of ICTs.

4.1. Brief Presentation of the Municipal Education Network of Jundiaí-SP

Jundiaí, a municipality in the state of São Paulo, has an advanced educational network and a high Municipal Human Development Index in Education (IDHM) of 0.768, with a literacy rate of around 95%, reflecting broad access to education and technology for the population. The management of elementary education, under the municipality's responsibility since 1999, includes 50 schools that offer both partial and full-time education, serving approximately 19,035 students (MUNICÍPIO DE JUNDIAÍ, 2016).

The organizational structure of the Municipal Secretariat of Education (SME) includes SME management, school management, and teachers, most of whom have higher education degrees, with many holding postgraduate qualifications. The schools adhere to Law 11.738/2008, which establishes the minimum salary and working hours. This research focused on three of these schools (Alfa, Beta, and Gamma), representing socio-economic and technological access diversity. These institutions are included in the 2015 Municipal Education Plan, which aims to improve infrastructure, teacher training, and access to high-speed internet, emphasizing the need for greater teacher participation in educational decisions (MUNICÍPIO DE JUNDIAÍ, 2015).

a) Work Environment in the Schools of the Municipal Education Network of Jundiaí-SP

The "work environment" in the schools of Jundiaí, composed of physical and social elements, is crucial for the effective implementation of pedagogical practices, especially with the integration of ICTs. The infrastructure was evaluated through visits and interviews, highlighting that, despite Jundiaí's high ranking in the Connect Smart Cities index, limited access and slow internet speed are significant obstacles, with only 81.2% of schools having internet access according to the 2015 School Census (INEP, 2016).

b) Infrastructure and Connectivity

It is evident that the quality of the internet is a crucial element for the effective use of Information and Communication Technologies, as observed in the schools of Jundiaí. According to the 2015 School Census, urban schools generally had fixed broadband connections with speeds of 2 Mbps, which would be sufficient for basic activities but not for more demanding interactive content. Rural schools, on the other hand, rely more on mobile connections (INEP, 2016).

The IT infrastructure in the schools, as observed during visits, included computers and printers but faced significant challenges with the irregular distribution of Wi-Fi, which did not cover all areas, limiting its use in several classrooms. Teachers expressed frustrations related to connectivity:

> The problem is the internet. We had the computers, monitors, desks, the room; in short, everything was set up to work, but there was no internet. The most expensive resource, which would be the equipment, was all set up. — [Teacher L]
> Yes, we have an internet signal, but it doesn't always reach all the classrooms. So, sometimes it does make it difficult to use. That's why, most of the time, we bring things from home, like videos we prepare. — [Teacher M]

These statements highlight the need for improvements in infrastructure to ensure continuous and reliable internet access throughout the school areas, thus facilitating the pedagogical use of ICT.

c) Equipment and Maintenance

In Jundiaí-SP, the equipment in schools was primarily intended for teacher use, with limited access for students, especially in the early years of education. Maintenance was sporadic and depended on external services or municipal technical support, which did not always respond promptly to school needs. This scenario complicates the integration of ICT in everyday school life due to the lack of adequate infrastructure and accessible equipment for students. Teachers often used their own devices to facilitate teaching, reflecting the urgent need for substantial improvements in technological infrastructure and continuous training for the effective use of ICT. Teacher testimonies illustrate these challenges:

> There was a time when we had the computer lab, but the lack of maintenance was very significant. There was a technician, but the time available for us to get familiar with the equipment was very limited. — [Teacher N]
> When we have a problem, we submit a repair request to the city hall, and the CIJUN staff comes to the school to make the repairs. — [Teacher L]

4.2. Communication Spaces and the Use of ICT in the Municipal Schools of Jundiaí-SP

In the analysis of communication spaces and the use of digital technologies in Jundiaí, both formal and informal interactions involving digital technologies in schools stand out. The teachers' experience reflects a combination of mandatory and voluntary use of these technologies, integrated in various ways into pedagogical practices. Almeida and Rubim (2004) emphasize the importance of school leaders' involvement in promoting continuous training and the use of ICTs, which is essential for transforming schools into spaces of shared knowledge.

The testimonies of the teachers reveal differentiated uses of ICTs, ranging from formal institutional applications to autonomous initiatives. For example, the use of applications such as WhatsApp and Facebook for communication and sharing among teachers illustrates the autonomy in adapting ICTs to local needs. Some teachers share:

> I use my smartphone for everything! I have the speakers, that computer the Ministry of Education sent... We'll be using it today in our study hours meeting, it's a multimedia device with several functions. — [Teacher S]
> WhatsApp is used for direct and quick communication among school members, facilitating the organization and dissemination of information. Facebook serves as a platform for English teachers to share resources and ideas, promoting collaborative practices strengthened by technology. — [Teacher N]
> Nowadays, WhatsApp is everywhere, and we can't help but use it. We have the school group, where announcements and messages are shared, so we also use it as a work tool. — [Teacher L]

The testimonies demonstrate how ICTs are essential for efficient communication and for enriching pedagogical practices, adapted by teachers to meet educational and organizational demands in a creative and effective manner.

4.3. Institutional, Contractual, and Functional Work Relations

The effective integration of ICTs into pedagogical practices is deeply influenced by the contractual and functional working conditions of teachers. According to Soares (2012), a crucial aspect is lesson planning, which often exceeds the recommended hours, resulting in increased workload and potential overload. Mill and Fidalgo (2009) warn that this extension of work beyond regular hours can blur the boundaries between personal and professional life, especially when teachers use personal time to prepare digital materials or interact with students through social platforms, as reported by the teachers:

> Yes, using WhatsApp, Facebook, or they call to say they are sick, etc. — [Teacher J]
> Even because we have the school group where announcements and messages are shared, so it also serves as a work tool. — [Teacher L]

In addition, the number of students per class directly impacts the teachers' workload. While legislation recommends up to 25 students per class, Schools Alpha and Gamma often exceeded this number, increasing the demand on teachers, especially those with multiple classes, as illustrated by the testimonies of Teachers M and C.

The scenario, therefore, revealed the urgent need to improve working conditions, expand access to technological resources, and strengthen the IT infrastructure to support the efficient use of ICTs, ensuring that pedagogical practices could be enriched without imposing undue burdens on teachers.

5. On Digital Literacy and the Working Conditions of Teachers in the Face of ICTs

The proper integration of digital technologies in schools requires teachers to develop digital literacy, critically understanding and using digital language and social interactions. This digital literacy involves understanding concepts such as "digital," "analog," "digital culture," "cybernetics," and "cyberspace," which are essential for navigating and effectively using innovative technologies. According to Lévy (1999), this digitization of everything consists of translating information into numbers, encoding nearly all information and texts in the form of numbers. "More fluid, more volatile, digital recording occupies a very particular position in the succession of images, prior to their visible manifestation, not unreal nor immaterial, but virtual" (Lévy, 1999, p. 56).

This transformation enables the "virtualization of the real," where reality and virtuality blend, forming hybrid spaces where digital and analog environments coexist. Virtuality intensifies interactivity and creates possibilities for hybrid media, where users are simultaneously consumers

and producers of content. Alonso (2008) emphasizes the historical importance of ICTs, highlighting the correct use of the acronym:

> Strictly speaking, the acronym should be ICTs (Information and Communication Technologies), because information and communication technologies have existed since time immemorial, but their digital forms are a phenomenon that consolidated in the last decade of the 20th century (Alonso, 2008, p. 169).

In this context, it is crucial for teachers to reflect on how they interact with these technologies, not only as users but as critical mediators and content producers, empowering themselves to lead discussions and activities that promote a deep understanding of the digital society and its implications for education.

5.1. The teachers' perception of ICTs

Teachers' perception of ICTs is shaped by their previous experiences and the growing social digitization. Santos (2006) discusses how internet connectivity, combined with a structural monopoly, promotes a sociotechnical fluidity that profoundly affects the thinking and behavior of individuals, including teachers.

> However, fluidity is not a technical category, but a sociotechnical entity... alongside new technical innovations, norms of action are operating, starting with deregulation (Santos, 2006, p. 186).

Chakur (2002) identifies two models of teacher training: the technical-specialist model, focused on solving practical problems, and the "practical-reflective" model, which investigates one's practice to develop professional growth. "Practice is conceived as a process of investigation in action, the core of teacher training" (Chakur, 2002, p. 151). It is also important to consider Kenski's (2008) perspective, which suggests that many teachers maintain an optimistic, though superficial, view of ICT integration. The importance of ICTs for student engagement and the need for proper guidance on the use of technologies are points emphasized by the teachers in the study:

> I think it's a very rich tool because it involves the student in your proposal, making the student's learning more meaningful. — [Teacher L].
> My husband worked in the municipality of Campo Limpo, where there was a computer lab [...] So, I believe that it's not enough just to provide the internet. It's necessary to provide tools in the didactic area, to teach what a computer is and what it's for. — [Teacher L].
> No, because I have always taken the initiative to seek this out and bring it to them. After all, this is part of it, and if we avoid it, we will end up being left behind. — [Teacher C].

These perceptions reveal that, in addition to accessing technologies, teachers need a critical understanding in order to effectively integrate them into their pedagogical practices, reflecting on their ability to influence and transform the educational environment.

5.2 Teacher Training in the Perception of Educators from the Municipal Education Network of Jundiaí-SP

In the context of informational capitalism, the need for continuous knowledge updating for educators is crucial. Initial training is often insufficient and does not adequately prepare teachers for the current technological demands, with the inclusion of technology in education often being superficial and not effectively integrated into curricula. Gatti and Barreto (2009) question whether the courses offered truly provide a solid foundation for the practical application of new technologies in education. The testimonies of educators in Jundiaí reflect this concern:

> When I studied pedagogy in 2002, I had a course on information technology in education. I just felt it was too little, only one semester and on Saturdays. — [Teacher M]
> I didn't have anything, because I graduated in 1990. Digital technology was still yet to arrive. — [Teacher C]

These accounts highlight the gap between the training received and the current practical needs. Marcelo Garcia (2009) emphasizes that teachers' professional identity develops throughout their careers, suggesting the importance of continuous training that keeps pace with technological advancements. Mizukami (2004) reinforces that the knowledge base for teaching is dynamic and must be continuously developed:

> The knowledge base for teaching consists of a body of understandings, knowledge, skills, and dispositions that are necessary for the teacher to facilitate teaching and learning processes [...] (Mizukami, 2004, p. 38).

For the effective integration of ICTs, it is essential that teachers adopt a critical and reflective approach. UNESCO (2009) suggests key competencies for digital literacy:

- Knowledge and understanding of media for democratic and social participation.
- Critical evaluation of media texts and information sources.
- Responsible production and use of media and information.

These skills are essential to meet contemporary demands and empower teachers to use digital technologies more effectively and consciously.

a) Pedagogical Use of ICTs (Information and Communication Technologies)

Although digital technologies were a constant presence in the daily lives of teachers and students in Jundiaí, there was still a lack of a clear pedagogical project that systematically incorporated these technologies. Teachers use online resources provided by publishers and multimedia equipment, but these initiatives seemed to be more individual or isolated rather than formally integrated into the curricula. Some of the teachers' testimonials highlight this:

> Moderna, Presente, and Ática provide internet access, offering a variety of activities as support for the teacher. — [Teacher L]
> I use my smartphone for everything! I have speakers, a computer that the Ministry of Education sent, it's a multimedia device with various functions. — [Teacher S]

b) Training and Continuing Education

Programs such as Proinfo Integrado emphasize the need for an institutional support structure for the effective integration of ICTs in education. These programs not only provide the necessary technological resources but also train teachers to use these tools in a pedagogically meaningful way. Teacher C points out that:

> In the field of English, we are very focused on technology. [...] We have an excellent trainer through the municipal network, a professional with her own company, but who has strong ties with USP. One of the workshops we conducted was about the use of technology in the classroom. — [Teacher C]

The need to strengthen both institutional policies and teachers' autonomous initiatives is clear. This balance between institutional support and teacher autonomy is essential to maximize the benefits of ICTs in the educational environment. Teachers face challenges such as inadequate infrastructure and insufficient technical support, which can limit the full use of ICTs. However, the creativity and initiative of teachers in adapting and integrating technologies into their practices offer an optimistic glimpse of the transformative potential of education through technology.

5.3. Media and Information Literacy and Digital Literacy of Teachers in the Municipal Education Network of Jundiaí-SP

Digital literacy, essential in the current context of ICTs, goes beyond mere literacy, encompassing complex social practices of reading and writing that adapt to the digital age. Soares (2002) defines literacy as:

> [...] individuals or social groups who master the use of reading and writing [...] maintain forms of interaction with others and with the world around them [...] that grant them a specific and differentiated state or condition of inclusion in a literate society (Soares, 2002, p. 145-146).

With ICTs, new forms of language and interaction emerge. Gilster (1997) suggests four essential competencies for digital literacy:

- Critical evaluation of information.
- Reading in hypertextual mode.
- Association of different information sources.
- Competence to navigate virtual libraries.

These skills help teachers navigate the digital environment effectively, shaping digital literacy for educators. UNESCO (2009) also contributes to this discussion by defining criteria to assess teachers' digital literacy. In this sense, some teachers' comments support these ideas of critical evaluation of information, critical analysis of ICTs, pedagogical applications of technologies, etc.:

> [...] knowing how to search for and select information is more important than some other things [...] teaching how to search, select, and seek information [...] is what they have access to, but they lack the knowledge of how to use it. — [Teacher L]
> Teaching how to research, which website to trust [...] the reliability of a given document. — [Teacher M]
> We did one of the opinion articles on the use of cell phones in schools [...] for or against [...] making improper use of them. — [Teacher J]
> I have an app that downloads children's stories and songs that are not in the textbook. I use YouTube a lot to download movies. — [Teacher S]
> Presenting a final product [...] a report, a poster, a drawing, a slogan [...] we made an audio message for them. — [Teacher S]

This scenario shows that teachers in Jundiaí were progressively integrating ICTs into their pedagogical practices, but they still faced significant challenges in developing comprehensive digital literacy. They emphasized the need for a more critical and in-depth approach to using these technologies to enrich teaching and learning.

The following tables systematize the data collected for the objectives proposed by the research. Table 2 complements the profile of the interviewed teachers, including their subjects, years of experience, frequency of ICT use, and how they assess the contribution of technologies to their work and learning. A diversity of profiles is observed, but all of them used technologies frequently and recognized their value for pedagogical purposes.

Table 2. Profile of Basic Education Teachers from the Surveyed Schools

Teacher	Subject	Frequent Use of ICTs?	Contribution of Technologies to Work and Learning
C	English	Yes	Source of information (research); student engagement.
J	Multidisciplinary	Yes	Various aspects.
L	Multidisciplinary	Yes	Student engagement and connection.
M	Multidisciplinary/ History*	Yes	Connection and student language.
N	Multidisciplinary	Yes	Depends on the context.
S	Multidisciplinary	Yes	Engagement with families through content production.

Source: Prepared by the author, based on the data collected for the research.

(*) The teacher in question teaches History for middle school (Grades 6-9).

The synthesis of the profiles obtained through the interviews indicates that all the interviewed teachers report frequent use of technologies and believe there are significant contributions arising from this use in relation to their pedagogical work. Student engagement and connection were the most frequently mentioned advantages by the teachers, but unexpected elements, such as "engagement with families," also emerged.

Regarding the pedagogical environment, infrastructure for cabling and internet distribution was found in all schools, but with limitations. The internet distribution did not reach all classrooms, making access limited. The computers available were mostly restricted to teachers' use for extracurricular activities. Escola Alfa is an exception, with a multifunctional computer provided by the Ministry of Education (MEC). Table 3 details the technologies explored.

Table 3. Most Adopted Technologies by Teachers for Classes.

Teacher	Use of which ICTs in teaching activities?	Applications considered most effective in the educational process
C	Laptop; desktop computer	YouTube; PowerPoint; Visiteacher (website)
J	Laptop.	WhatsApp; Facebook.
L	Laptop; desktop computer	YouTube; WhatsApp; digital textbook support.
M	Laptop; desktop computer	YouTube; PowerPoint.
N	Laptop.	Microsoft Office.
S	Laptop; tablet; smartphone	MEC computer; digital textbook support; PowerPoint; YouTube.

Source: Prepared by the author, based on the data collected for the research.

Laptops were the most commonly used technology among teachers. For applications and platforms, the most popular included YouTube, PowerPoint, WhatsApp, Facebook, and digital resources linked to the textbook. Although teachers had varied preferences for the applications used, there was a clear reliance on tools that facilitate information presentation and student engagement, such as YouTube and PowerPoint. The variety of technologies indicates a combination of traditional and digital teaching practices, which could be further expanded with more institutional and technical support. Other teachers mentioned text editors and digital books as useful resources. Despite this, teachers reported not feeling pressured or encouraged to use ICTs in the classroom, although they were aware of their mentions in the Municipal Education Plan (PME).

Table 4. Appropriateness of ICT Integration Proposals in Schools

Teacher	Institutional guidance or requirement for the use of ICTs?	How can schools promote the use of ICTs?	Significant factors for the use/ non-use
C	No	Workshops and courses	Initiative/insecurity
J	No	Adequate infrastructure	Training and infrastructure
L	No	Adequate infrastructure	Training/purchasing power
M	No	Specific training	Training/purchasing power
N	No	Initiative is self-driven	Individual leadership
S	Yes	Initiative is self-driven	Initiative/insecurity

Source: Prepared by the author, based on the data collected for the research.

There was a clear division among the teachers regarding how to promote the use of ICTs. Some advocated for teachers' self-initiative, while others emphasized the need for infrastructure and training.

- *Insecurity/Initiative:* Teachers who mentioned personal insecurity highlighted the importance of initiative and leadership in using ICTs.
- *Training/Infrastructure:* Those who emphasized the lack of training and resources believe that specific training and adequate infrastructure are essential.

These results indicate that the ideal approach should include both the creation of infrastructure and continuous training. Regarding institutional communication spaces through digital technologies, there was no institutional presence of these spaces, and their implementation depended solely on the active involvement of the professionals.

6. Final Considerations

The final considerations of this study, based on data collected from schools in the Municipal Education Network of Jundiaí-SP and interviews with teachers, reveal significant challenges in integrating Digital Information and Communication Technologies (ICTs) into the educational environment. The research identified that, despite ICTs reshaping cultural expressions and redefining the global communication landscape, their implementation in schools often fails to take into account the obstacles faced by teachers, limiting educational innovation.

It was observed that there is a disconnect between the theory of educational modernization and the actual practices in the school environment, evidenced by the insufficient infrastructure and adequate technical support. This gap creates disproportionate demands that can undermine the working conditions of teachers. Additionally, the workload overload, due to excessive hours and a high number of students per class, hinders pedagogical planning and teacher performance.

However, teachers still recognize the importance of ICTs in engaging students, although they often have to rely on their own devices and limited resources, such as laptops and basic applications.

The lack of institutional integration for communication via digital technologies, as evidenced by the absence of virtual spaces organized by the school, forces teachers to autonomously create groups on platforms like Facebook or WhatsApp. This shows that, while teachers are adapting and using the available technologies to enhance engagement and communication, schools still do not provide the necessary support to optimize the pedagogical use of ICTs.

For the integration of ICTs to be effective and meaningful, it is crucial that robust public policies, grounded in critical analyses of teachers' working conditions, are developed. It is recommended that investments be made in infrastructure, continuous training, technical and administrative support, as well as the creation of an environment that values and respects teachers' autonomy. These actions will ensure that technologies are not only used innovatively but also strengthen the critical and creative role of teachers in shaping future generations.

Finally, the study revealed that the infrastructure found was insufficient for pedagogical needs, as connectivity and technological equipment did not fully meet the demands of the classroom, leading teachers to seek their own alternatives to address these shortcomings. The maintenance of equipment, centralized in the Municipal Department of Education rather than within the schools themselves, and the absence of local technicians, highlight the need for a revision and improvement of conditions so that ICTs can be truly integrated and effective in the educational environment of Jundiaí.

To conclude these considerations and final points about the study, we have prepared Table 4, which organizes the key ideas discussed through the data and arguments throughout the text, exploring the conditions for the integration of ICTs in schools of the Municipal Education Network of Jundiaí-SP.

Table 5. Key Ideas Analyzed in the Text

Category	Details
Cultural and Communicational Impact of ICTs	ICTs have reshaped cultural expressions and global communication, creating a networked society. These changes profoundly influence educational systems, highlighting challenges in distinguishing between pedagogical and technological innovation and the need for the effective integration of these tools.
Implementation Challenges	Schools face significant difficulties in implementing ICTs. Studies indicate that the obstacles teachers face are often ignored, hindering educational innovation and emphasizing the need for supportive policies.
Disconnect Between Theory and Practice	There is a substantial disconnect between educational modernization theories and actual practice in schools, evidenced by the lack of adequate infrastructure, technical support, and proper working conditions.
Use of Personal Resources	Teachers often use their own devices and applications, such as YouTube and PowerPoint, to overcome resource limitations in schools, indicating a lack of equipment and specific training for pedagogical use.
Workload Overload	Work conditions, including workload and class size, often exceed recommended limits, negatively affecting teachers' planning and performance.

Need for Adequate Public Policies	It is crucial that public policies be based on critical analyses of teachers' working conditions and include investments in infrastructure, continuous training, and technical support to ensure the innovative use of ICTs that respects teachers' autonomy.
Insufficient Infrastructure	The current infrastructure does not meet pedagogical needs, with connectivity and technological resources provided by government programs being more focused on administrative demands than on classroom activities.
Maintenance of Equipment	Equipment maintenance is centralized in the Municipal Department of Education, not in the schools, potentially failing to meet the immediate needs of teachers, who often have to manage the maintenance of their own devices.

Source: Author's own elaboration.

This table highlights the need for a holistic approach to improve the integration of ICTs into pedagogical practices and to address contemporary challenges in education, considering both institutional support and teachers' autonomy.

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